WE CLAIM:

1. In apparatus for purifying water comprising:

a pressure vessel having opposing inlet and outlet ends, and enclosing at least three spiral-wound elements, each spiral-wound element having a feed water channel and a permeate collection tube, where the spiral wound elements are connected in series coaxially within the filtration pressure vessel;

an improvement wherein the elements in series comprise

a. a lead element with an inlet in communication with the to the inlet of the filtration pressure vessel, so that the inlet of the lead element provides and initial feed to the feed water channel of the lead element ; with an optional permeate outlet in communication with an outlet of the filtration vessel, so that permeate from one or more of said spiral wound elements can be removed, as desired, from said end of the filtration pressure vessel;

b. an intermediate element connected to an upstream element and a downstream element so that the intermediate element is supported and aligned axially within the filtration pressure vessel;

c. and a tail element with an exit port in communication with the outlet end of the filtration pressure vessel, so that permeate water from one or more of said elements can be withdrawn, as desired, from said outlet end of the filtration pressure vessel and the residual feed water streams from the tail element can exit the filtration pressure vessel;

where the spiral-wound elements comprise a spiral wound element having a maximum value of standard specific flux, a spiral wound element having a minimum value of standard specific flux, and a spiral wound element having an intermediate value of standard specific flux; and where maximum value of standard specific flux divided by the minimum value of standard specific flux is greater than 2; and the intermediate element has a value of standard specific flux that is an intermediate value between about 1.25 of the minimum value and about 0.85 of the maximum.

2. The apparatus of claim 1 where the element having a maximum value of standard specific flux is of a first element type, the element having an intermediate standard

specific flux is of a second element type, and the element having a minimum value of standard specific flux belongs to a third element type.

3. The apparatus of claim 1 where the standard specific flux of the tail element divided by the standard specific flux of the lead element is greater than 2.

4. The apparatus of claim 1 wherein the standard specific flux for the tail element is greater than 1.5 $L/m^2/hr/bar$.

5. The apparatus of claim 1 wherein the lead element has a standard specific flux less than 1.0 L/m2/hr/bar.

6. The apparatus of claim 1 wherein the tail element has a feed spacer cross sectional area that is at least 15% less than the feed spacer cross sectional area of the lead element.

7. The apparatus of claim 6 wherein the tail element has a feed spacer cross sectional area that is at least 30% less than the feed spacer cross sectional area of the lead element.

8. The apparatus of claim 1 wherein the feed spacer for the tail element has a standard pressure gradient greater than about 0.4 bar/m.

9. The apparatus of claim 1 wherein the feed spacer for the tail element has a standard pressure gradient that is 50% greater than the standard pressure gradient for the feed spacer sheet of the lead element.

10. The apparatus of claim 1 wherein the ratio of standard solute permeability to standard specific flux for the tail element divided by the ratio of standard solute permeability to standard specific flux for the lead element is less than 2.

11. The apparatus of claim 1where the tail element produces a permeate salt concentration of less than 500 ppm when tested using 25°C, 32000 ppm NaCl in the feed, 8% recovery, and a flux of 27 $L/m^2/hr$.

12. The apparatus of claim 1 wherein the filtration pressure vessel is one of two or more parallel filtration pressure vessels in a filtration system.

13. The apparatus of claim 1 further comprising a barrier positioned either within the permeate collection tube of a spiral wound element or between the permeate collection tubes of two adjacent elements; where the barrier defines first and second combined permeate streams; where the first combined permeate stream comprises

the permeate from the lead element and the second combined permeate stream comprises the permeate from the tail element; where the barrier further preventing mixing of permeate between the combined permeate streams.

14. The apparatus of claim 13 where the first combined permeate stream has a pressure greater than a pressure of the second combined permeate stream of at least 1.5 bar; where the first combined permeate stream comprises the entire of permeate from the element having the maximum value of standard specific flux, where the first combined permeate stream is a feed stream to a second filtration vessel.

15. A process for purifying water comprising the steps of:

a. flowing a feed solution through a filtration pressure vessel containing at least three spiral wound elements in series, the elements in series including a lead element proximate to the feed inlet end of the vessel and a downstream element; wherein the elements in series comprise a spiral wound element having a maximum value of standard specific flux and a spiral wound element having a minimum value of standard specific flux, and the maximum value of standard specific flux divided by the minimum value of standard specific flux is greater than 1.5;

b. applying filtration pressure to the feed solution to cause permeate to pass through each element within the vessel, and

c. removing permeate and concentrate solutions from the vessel,

wherein the feed solution has an osmotic filtration pressure greater than 20 bar at the inlet of the vessel.

16. The process of claim 15 wherein the standard specific flux for the downstream element divided by the standard specific flux for the lead element is greater than 1.5.

17. The process of claim 15 wherein the downstream element has a standard specific flux that is greater than 1.5 L/m^2/hr/bar.

18. The process of claim 15 wherein an average net driving pressure for the lead element divided by an average net driving filtration pressure for the downstream element is greater than 2.

19. The process of claim 15 wherein the downstream element is the tail element of the vessel.

20. The process of claim 17wherein the lead element is operated with an average flux that is less than twice the average flux for the vessel.

21. The process of claim 15 wherein the vessel contains at least five spiral wound elements in series, the volume of the concentrate solution produced is no more than twice the volume of the permeate solution produced, the average flux for the vessel is at least 70% of the average flux for the lead element, and the lead element has an average flux of between 10 and 27 $L/m^2/hr$.

22. The process of claim 21 where the average flux for the vessel is at least 80% of the average flux for the lead element.

23. The process of claim 21 wherein the lead element is operated with an average flux less than 34 $L/m^2/hr$ and the vessel is operated with an average flux greater than 24 $L/m^2/hr$.

24. The process of claim 21 wherein the concentrate solution has an osmotic pressure that is more than twice the osmotic pressure at the inlet.

25. The apparatus of claim 15 wherein the downstream element has a feed spacer cross sectional area that is at least 30% less than the feed spacer cross sectional area of the lead element.

26. The apparatus of claim 15 wherein the downstream element has a NaCl passage greater than 20% when the element is tested individually using a flux of 27 $L/m^2/hr$, 8% recovery, and a 25°C feed solution consisting of 32000 ppm NaCl in water, and wherein the downstream element has a sulfate passage less than 1% when tested individually using a flux of 27 L/m2/hr, 8% recovery, and a 25°C feed solution consisting of 32000 ppm NaCl and 2000 ppm $MgSO_4$ in water.

27. The process of claim 15 the element having a maximum value of standard specific flux belongs to a first element type, the element having a minimum value of standard specific flux belongs to a second element type, and the standard specific flux for the first element type divided by the standard specific flux for the second element type is greater than 2.

28. The apparatus of claim 15 further comprising an essentially impenetrable barrier to permeate flow within the first pressure vessel, the barrier defining first and second combined permeate streams, the first combined permeate stream comprising the entire of permeate from the lead element and the second combined permeate stream

comprising the entire of permeate from the tail element; wherein the first combined permeate stream becomes the feed stream to a second filtration pressure vessel, and wherein the lead element divided by the minimum value of standard specific flux is greater than 1.5.

29. A process for purifying water comprising the steps of:

a. flowing a feed solution through a filtration pressure vessel comprising at least three spiral wound reverse osmosis elements, where the three spiral wound elements comprise an upstream element, a downstream element, and an intermediate element located between the upstream and the downstream elements, wherein the standard specific flux for the downstream element divided by the standard specific flux for the upstream element is greater than 2, and the standard specific flux for the intermediate element divided by the standard specific flux for the upstream element is between 1.25 and 1.75,

b. applying pressure to the feed solution to cause permeate to pass through each element within the vessel, and

c. removing permeate and concentrate solutions from the vessel,

wherein the difference in applied pressure and osmotic pressure at the inlet of the vessel divided by the difference in applied pressure and osmotic pressure at the outlet of the vessel is greater than 2.

30. The process of claim 29 wherein the downstream element has a standard specific flux greater than 1.5 $L/m^2/hr/bar$.

31. The process of claim 28 wherein the feed solution has an osmotic pressure greater than 20 bar at the inlet of the vessel.